Pressure and height experiment

In this activity you will perform an experiment to try to determine the relationship between air pressure and height. For this you will need a phone with a barometer sensor and an instrument to measure height (ruler, measuring tape,…).

Download an app to measure atmospheric pressure (barometer). I personally recommend the “[Physics Toolbox Suite](https://play.google.com/store/apps/details?id=com.chrystianvieyra.physicstoolboxsuite)” . You will need a precision/resolution of at least 5Pa. If the units of your app are not in Pascals, you will have to convert them. Check that you get a different pressure when you put the phone at your feet or above your head. If that is the case, then the app is suitable.

You will now measure the atmospheric pressure at constant interval heights within the building. Divide the entire staircase of the building into ten. Starting on the ground floor, take a measurement of pressure at each interval. Repeat three times. The larger the range the better the results.

Measure the distance between intervals. In the worst-case scenario, you can measure the height of a single step and multiply by the number of steps. Do not lean out over heights, stay safe!

Record all measurement in the table. (3)

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| --- | --- | --- | --- |
| Height /m ± | Pressure / Pa ± | Pressure / Pa ± | Pressure / Pa ± |
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Process the data (2)

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| --- | --- | --- |
| Height /m ± | Average  Pressure / Pa | Uncertainty in Pressure / Pa |
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Make a graph with the independent variable in the x-axis and the dependent variable in the y-axis. Copy it here. Remember to include title, label of axis, error bars, trendline, equation of best fit, R coefficient, max and min lines of best fit,… (5)

Answer the following questions

* 1. Describe the mathematical relationship between the variables. [1 Mark]
  2. Discuss whether this was expected. [2 Marks]

1. Determine the physical meaning of the gradient in this graph.
   1. What physical parameter can you extract from it? Determine its value. [1 Mark]
   2. Compare the value found in a) to standard values (check online sources). Outline whether the value found is reasonable. [2 Marks]
2. State the physical meaning of both intercepts [2 Marks]

y-intercept:

x-intercept:

1. Discuss the reliability, precision, and accuracy of the experiment. Make sure to support your claims with evidence from the data, graph, and details of the methodology. [5 Marks]
2. Sketch a graph to show how the trend would be different if the experiment were repeated with a much larger range of heights. [2 Marks]